Remarks

The Examiner is thanked for the Office Action mailed 10/01/01 (a request for a 2-month extension of time to respond is enclosed). Claims 1-44 are pending in the present application and are under consideration.. The Examiner's rejections are discussed below in the sequence in the Action. Paragraph numbers refer to the paragraph numbers in the Action except where otherwise noted.

I. 35 U.S.C. 112 Indefiniteness Rejections (Paragraph 4)

The Examiner raised a number of rejections of claims 1-44 under this heading. The Examiner is thanked for the helpful suggestions for further clarifying claim language.

Paragraph 4a

The Examiner rejected claims 1-25, 30 and 33 1 on the basis that claim 1 does not recite positive action steps for a "method for fabricating at least one addressable array of biopolymers" as recited in the claim preamble. However, paragraph (a) of claim 1 positively recites:

> "(a) for each of multiple addresses, dispensing droplets carrying the biopolymers or biopolymer precursors from a drop dispenser unit onto the sensing element, and onto the substrate so as to fabricate the array;" (emphasis added)

This is a positive step (dispensing droplets of specified composition) for fabricating an array.

On the question of whether this language satisfies 35 USC § 112, second paragraph, the Federal Circuit's discussion in Miles Laboratories Inc. v. Shandon Inc. 27 USPQ 1123 @ 1126 (Fed.Cir. 1993) is instructive:

> "The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. *Orthokinetics*, 806 F.2d at 1576. If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more. *Hybritech*, 802 F.2d at 1385. The degree of precision necessary for adequate claims is a function of the nature of the subject matter. *Id.*"

Further, M.P.E.P. § 2173 outlines the same approach when considering the second paragraph of 35 USC § 112.

In the present case, one skilled in the art reading the language of paragraph (a) of claim 1 would at least be "reasonably apprised" of the scope of the invention in that it is clear if they fabricate a biopolymer array by depositing droplets carrying the biopolymers or biopolymer precursors from a drop dispensing unit onto a substrate so as to fabricate the array, they are falling within the ambit of claim 1 (assuming, of course, they meet the other recited limitations of that claim). Given the language of paragraph (a) of claim 1 then, it is submitted that it at least meets the requirements for definiteness as recited in Miles Laboratories and the M.P.E.P., and that the present rejection should therefore be withdrawn.

Paragraph 4b

The Examiner rejected claims 1-25, 30, 33 on the basis that it is unclear whether the droplets are dispensed onto one surface (the substrate) or two (the substrate and the sensor). As pointed out in Miles Laboratories, in evaluating definiteness the claim terminology must be read in light of the specification. In the present case, the specification makes it clear that the sensor may or may not include the substrate itself (see, for example, page 14, line 22 to page 15 line 21, in which both these sensor configurations are described; as well as dependent claim 17 wherein the sensor is recited as comprising the substrate). Accordingly, when read in light of the specification it is clear that claim 1 encompasses the possibility of sensor including the substrate or being separate. However, to make this abundantly clear, claim 1 has been amended to expressly recite that the sensor optionally comprises the substrate.

Accordingly, it is believed this rejection should now also be withdrawn.

Paragraph 4c

The Examiner rejected claim 7 as indefinite in reciting "changing a set of one or more reagents in the dispenser unit" on the basis that "a set of one or more" and "reagents" lack antecedent basis. However, the Examiner parses the one phrase into two parts. The claim language recites "a set of one or more reagents". Thus, this phrase references "a set of...reagents". Since this phrase is being introduced into claim 7 for the first time, it is properly preceded by the indefinite article "a". Accordingly, there is no lack of antecedent basis. However, in an effort to try to expedite the prosecution of the present application, claim 7 has been amended to adopt the Examiner's suggested clarifying language.

Accordingly, this rejection should now be withdrawn.

Paragraph 4d

The Examiner rejected claim 7 on the basis that it is unclear at what step within the steps of claim 1, the additional step of changing reagents is performed. Claim 1 recites dispensing (paragraph (a) of claim 1), detecting (paragraph (b) of claim 1) and evaluating (paragraph (c) of claim 1). With respect to the changing, claim 7 specifically recites "wherein the detection and evaluation are performed after the changing and before a dispensing of any droplets for an array". Thus, this phrase clearly recites the order being: changing; then detection and evaluation; then dispensing of droplets. Accordingly, it is submitted this rejection should be withdrawn.

Paragraph 4e

Claim 10 was rejected on the basis that "features" in the phrase "one or more features on the array" lacks proper antecedent basis in claim 1. Accordingly, claim 1 has been amended to recite that the addressable array has multiple features.

Accordingly, this rejections should now be withdrawn.

Paragraph 4f

The Examiner next rejected claim 10 on the basis that "correlating" is a non-specific relational term. The Examiner suggested using "identifies" instead. While the exact language suggested by the Examiner was not adopted, the use of identifying has been adopted in amending claim 10 to now positively recite "identifying" those features which are defective as a result of the error.

Accordingly, it is believed this rejection should now also be withdrawn.

Paragraph 4g

Claim 11 was rejected in view of the recitation of "communicating information relating to the defective features". This claim has now been amended to positively recite communicating "an identity" of those features identified as defective.

Accordingly, it is believed this rejection should now also be withdrawn.

Paragraph 4h

Claims 15 and 16 were rejected on the basis that with the presence of the comma after "signals", is unclear if the signals are generated when the dispenser passes beyond the array. Accordingly, the foregoing comma has now been deleted in both of these claims and the present rejection should now be withdrawn.

Paragraph 4i

Claims 31, 32 were rejected based on lack of antecedent basis for "features" in claim 31. Claim 31 has now been amended to specifically recite in the preamble that the array has multiple features. Accordingly, this rejection should also now be withdrawn.

Paragraph 4j

Claims 31, 32 were rejected as indefinite for the use of "correlating" in claim 31. While the exact language proposed by the Examiner has not been adopted, the use of identifying versus correlating has been in that claim 31 has now been amended to positively recite that the processor "identifies one or more features on the array which are defective as a result of the error". Accordingly, it is believed this rejection should also now be withdrawn.

Paragraph 4k

The Examiner next rejected claim 32 on the basis that "information" lacks proper antecedent basis in claim 10 and that "relating" is a non-specific relational term. Claim 32 is being amended to delete these terms and to positively recite that the processor "communicates an identity of the identified defective features to a remote location or saves such information onto a storage medium". Accordingly, this rejection should now be withdrawn.

Paragraphs 4l and 4m

These rejections relate to claim 35. Claim 35 is presently being canceled such that this rejection is now moot.

II. 35 U.S.C. 103(a) Rejections (Paragraph 6)

The Examiner rejected claims 1-5, 7-14, 17-20, 28, 29, 31-37 and 43-44 as being unpatentable over Schantz et al. (US 6,086,190) in view of Brennan (US 5,474,796). The independent claims in these rejected claims are as follows (rejected claims of this group in "( )" thereafter are dependent thereon): claim 1 (4-5, 7-14, 17-20); claim 28 (29); claim 31 (32, 33); claim 34; claim 36 (37); claim 43; and claim 44.

The rejection of these claims as a group is first discussed below, with additional reasons for withdrawal of specified individual claims further discussed under the sub-titled claim numbers below.

All of the Rejected Claims

The Examiner states that it would have been obvious to modify the droplets of Schantz et al. with the "biopolymer" droplets of Brennan to arrive at the present invention. For precision, it is noted that Brennan actually deposits biomonomer drops (see FIG. 6). However, the present claims do include the possibility of depositing "biopolymer precursors".

This combination of Schantz et al. with Brennan is respectfully traversed on the basis that the references themselves fail to provide the requisite motivation and, if anything, actually teach away from the combination now suggested by the Examiner. Before discussing this point further, it is important to bear in mind that it is the prior art which must provide the requisite suggestion or motivation, not the Examiner based on a hindsight reconstruction using the Applicants' specification. This has been clearly stated by the Federal Circuit in, for example, In re Vaeck 20 USPQ2d 1438 (1991) @ 1442:

> "Where subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under s. 103 requires, *inter alia*, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. See *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. *Id.*"

In the present case, as the Examiner points out, Brennan provides a complete apparatus for depositing reagent drops to fabricate arrays. Schantz et al. provides a drop deposition apparatus which is a conventional ink drop deposition apparatus, with the exception that a drop detection device as described therein is further provided. The only motivation from the references to employ Schantz et al.'s apparatus to

accomplish Brennan's method might be argued to be for the additional use of Schantz et al.'s drop detection. However, a close reading of references fails to provide the requisite motivation for this. In particular, Schantz et al. provide two reasons for having a drop detector. First, nozzles which eject ink during a printing operation may become clogged due to paper fibers or clogging with dry ink during prolonged idle periods (column 1, lines 25-28). Second, to optimize the drive voltage to the thermal print head nozzles due to manufacturing variability in a thermal ink jet dispenser. The first of these reasons does not provide a motivation since Brennan does not refer to the use of paper, and it is not clear that the same "dry ink" problem would be present with the totally different non-ink solutions of Brennan under the conditions used to fabricate an array. On this point, while one might be tempted to actually try Breannan's solutions under array fabrication conditions to see if a drop detector might help, this amounts at best to an obvious to try situation and, as pointed out by the CAFC in In re Fine 5 USPQ2d at 1596 (Fed.Cir. 1988)) @ 1599 "whether a particular combination might be "obvious to try" is not a legitimate test of patentability" (citations omitted). With regard to the second of the foregoing reasons (optimizing the drive voltage in thermal printheads due to manufacturing variability) again this does not provide the requisite motivation since Brennan already provides a specifically constructed piezoelectric head which inherently has less than a 5% variability in drop size (see column 8, lines 8-64 and particularly lines 58-59). In fact the motivation, if any, from this then is to simply use Brennan's piezoelectric head rather than Schantze et al.'s more variable thermal head and then trying to compensate for this variability with the addition of a drop detector.

Given that the Examiner has not pointed to anything in the cited prior art which would motivate the combination proposed the Examiner, the present rejection should be withdrawn in relation to all of the rejected claims.

Additional Reasons with Respect to Other Claims

Claims 4, 5, 28, 29, 43

Claim 4 additionlly requires:

> "when after the dispensing of some droplets onto the substrate an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, then the source of the error is corrected prior to dispensing of other of the droplets onto that same substrate or the deposition apparatus is operated so as to compensate for the error during dispensing of other of the droplets onto that same substrate."

The Examiner has not satisfied her burden of pointing to a suggestion or motivation for this feature in the cited references. In particular, the Examiner points to column 6, line 38 to column 7, line 17 of Schantz et al. for this feature. However, the foregoing claim element requires correction "prior to dispensing of other of the droplets onto the same substrate" or to "compensate for the error during dispensing of other of the droplets onto that same substrate". With regard to claim 5, this further requires "prior to dispensing of other of the droplets for the same array or the deposition apparatus is operated so as to compensate for the error during dispensing of other of the droplets for the same array". In the lines in Schantze et al. cited by the Examiner, Schantz et al. only suggests testing nozzles "at the end of a print cycle on a page", not during a print cycle on a same substrate (claim 4) or a same array (claim 5).

For the foregoing additional reasons, this rejection of claims 5, 6 should be withdrawn.

Claim 28 includes an analogous limitation and the rejection of claim 28 should also be withdrawn for this same additional reason. Claim 29 is dependent on claim 28 and this same reasoning also applies. Additionally, claim 29 recites:

> "the processor causes the drop dispensing unit to dispense droplets toward the sensing element after dispensing of some droplets for an array; and when the error is detected the processor activates the operator alert or operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of the other droplets for that same array"

On page 9 of the Action, the Examiner rejects claim 29 on the basis that Schantz et al. teaches "when the error is detected the processor operates the apparatus to correct for the error or compensates for the error (Column 6, lines 23-64)". Even assuming the correctness of the foregoing statement this does not amount to a suggestion of the invention as claimed. In particular, the Examiner's argument is based on Schantz et

al. teaching correction or compensation for the error. On the other hand, claim 28 specifically requires alert or correction "after dispensing some droplets for an array" and "before, or...during...dispensing of the other droplets for that same array". Thus, even assuming the correctness of the Examiner's statement the claimed invention is still not obtained.

For this further additional reason, the rejection of claim 29 should be withdrawn.

Claim 43 contains an analogous limitation as discussed above in connection with claim 4 and should be allowed for the same additional reason as discussed above. In rejecting claim 43 on page 13 of the Action, the Examiner references column 6, lines 23-49 and Fig. 1 of Schantz et al. However, again none of the foregoing lines references requiring correction "prior to dispensing of other of the droplets onto the same substrate" or to "compensate for the error during dispensing of other of the droplets onto that same substrate", nor does the Examiner even allege they do. For this additional reason, the rejection of claim 43 should also be withdrawn.

Claim 7

Claim 7 additionally recites:

> "comprising changing biopolymers or biopolymer precursors in the dispenser unit to different biopolymers or biopolymer precursors, wherein the detection and evaluation are performed after the changing and before a dispensing of any droplets for an array.

The Examiner states that it would have been obvious to apply the different reagent sets of Brennan to the detection and evaluation of Schantz et al.. Even assuming this to be true, the Examiner has not pointed to anything in the cited references which motivates one to specifically perform the detection and evaluation after the changing of fluids in the dispenser unit, and before dispensing of the droplets.

For this additional reason, the rejection of claim 7 should be withdrawn.

Claim 9

This claim additionally recites that "the dispenser unit comprises a pulse jet which ejects a droplet in response to a signal and which can de-prime, and the error is corrected by re-priming the pulse jet". The Examiner points to column 7, lines 1-17 of Schantz et al. and states that this discloses "adjusts the voltage which primes the pulse". First, the foregoing lines merely refer to selecting an "optimum drive condition" (voltage; see line 13). There is no reference to "priming" anything. Second, even if in some abstract fashion there is some teaching of "priming a pulse" as the Examiner suggests (which is specifically disputed), this is not a teaching or suggestion for "re-priming the pulse jet" to correct a de-primed jet, as required by claim 9.

Accordingly, for this additional reason the rejection of this claim should be withdrawn.

Claims 10, 31, 44

This claim further requires "when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, identifying one or more features on the array which are defective as a result of the error". The Examiner states that it would have been obvious from Schantz et al. to "reject the array having droplets dispensed by the rejected dispenser unit for the obvious benefit of quality control". However, even assuming the correctness of this statement this still does not meet the invention as claimed, which requires identifying those features on the array which are defective as a result of the error.

Accordingly, for this additional reason the rejection of this claim should be withdrawn.

Claim 31 contains an analogous limitation ("identifies one or more features on the array which are defective as a result of the error") to that of clam 10 and should also be allowed for the foregoing additional reason. It is noted that in discussing claim 31 on pages 9-10 of the Action, the Examiner does not point to anything in the references alleged to disclose or suggest this feature.

Similarly, claim 44 contains an analogous limitation ("identifying one or more features on the array which are defective as a result of the error") to that of claim 10,

and should also be allowed for the additional reasons discussed above in connection with claim 10. In discussing the rejection of claim 44 on page 13 of the Action, it is noted that the Examiner does not even allege such a feature is disclosed or suggested by the cited references.

Claim 11, 32

This claim further requires "communicating an identity of the identified defective features to a remote location or saving such information onto a storage medium". The Examiner states that Schantz et al. "teach the method additionally comprising saving information relating to the defective features onto a storage medium i.e. printer processor (Column 6, lines 7-27)". However, in the foregoing lines the only data that is stored is a "drop detection value verses the number of ink drops contained in each of the bursts 30-32", which is used to determine the number of drops deposited (column 6, lines 23-27). Nothing in the foregoing lines relates to communicating an identity of the identified defective features or saving such information onto a storage means, as recited in claim 11.

Accordingly, for this additional reason, the rejection of this claim should be withdrawn.

Claim 32 contains an analogous limitation as claim 11 ("communicates an identity of the identified defective features to a remote location or saves such information onto a storage medium"), and the rejection of claim 32 should be withdrawn for the same additional reason as discussed in connection with claim 11.

Claim 13

This claim additionally recites:

"the dispenser unit comprises one or more pulse jets which eject a droplet in response to a signal which require priming; and
the evaluated performance characteristic is whether one or more of the pulse jets are primed prior to dispensing any droplets for an array"

The Examiner states that Schantz et al. "teach the method wherein the dispenser unit comprises pulse jets which eject a droplet in response to a priming signal (Column 3, lines 13-21) and the evaluated performance characteristic is whether one or more pulse jets are primed (Column 6, lines 23-27)". The referenced lines in column 3 refer to the drive voltage for actuating firing of the nozzles. This does not indicate that the disclosed pulse jets "require priming" as recited in claim 13. Even assuming such a feature is disclosed though, column 6, lines 23-27 disclose only using the previously stored relationship of drop detection value versus number of ink drops contained in each burst to determine the number of drops deposited and neither disclose nor suggest anything about the evaluated performance characteristic being whether the pulse jets are primed prior to dispensing any droplets for the array, as required by claim 13.

For this additional reason, the rejection of claim 11 should be withdrawn.

Claims 17, 35

Claim 17 additionally recites that "the sensor comprises the substrate". Note that by the language of claim 1 (upon which claim 17 is dependent), that the substrate is the element on which the biopolymer array is formed. The Examiner states that Schantz et al. teaches the sensor comprises the substrate i.e. the surface upon which the droplets are dispensed, and references column 7, lines 26-30. However, the foregoing lines refer to the sensor being an electrically conductive layer "contained in a trough or spittoon that accepts test ink drops". Even assuming that it is obvious to use Schantz et al. apparatus to fabricate an array (which is disputed above), clearly the sensor of Schantz in the foregoing lines is not the substrate on which the array is formed. Thus, even assuming the correctness of the Examiner's suggested combination, the invention of the present claim is still not obtained.

Therefore, for this additional reason this rejection of claim 17 should be withdrawn.

Claim 34 contains a similar limitation as claim 17 ("the sensing element comprises the substrate holder") and the rejection of this claim should also be withdrawn for the same additional reason as discussed above in connection with claim

17. It is noted that in discussing the rejection of claim 34 on pages 10-11, the Examiner does not even allege that the foregoing feature of the sensing element comprising the substrate holder is disclosed or suggested by the references.

Claim 37

This claim additionally recites that:

> "the processor evaluates droplet velocity based on the difference in time between when the dispenser unit was activated to dispense a droplet and the time when the resulting signal is detected

The Examiner references Schantz et al. column 4, lines 22-29 for this feature. However, in reviewing the foregoing lines no mention of evaluating a droplet velocity appears, far less evaluating such velotiy based on the difference in time recited in claim 37. Accordingly, the rejection of this claims should be withdrawn for this additional reason (lack of suggestion in the references).

III. 35 U.S.C. 103(a) Rejections (Paragraph 7)

The Examiner rejected claims 6, 15, 16, and 30 as being unpatentable over Schantze et al. and Brennan, as previously applied to claim 1 in the Action (see Part II above), and further in view of Brown et al. (US 5,807,522). In this rejection the Examiner in fact referenced "Brennen (U.S. Patent No. 5,474,794, filed 27 May 1993)". It is assumed here that the Examiner intended to reference Brennan US 5,474,796.

First, this rejection is traversed on the basis that the Examiner has not pointed to anything in Schantz et al. and Brennan which would suggest combining them in the manner proposed by the Examiner, as already discussed above under Part II ("All of the Rejected Claims"). Further, additional reasons for withdrawal of this rejection are discussed below in relation to the identified claims.

Claim 6

This claim requires:

> "wherein the error is detected after the dispensing of droplets for at least one of the arrays on the same substrate, and the source of the error is corrected prior to dispensing of droplets for other of the arrays on the same substrate or the deposition apparatus is operated so as to compensate for the error during dispensing of droplets for the same array or other of the arrays on the same substrate" (emphasis added)

Even assuming that it would have been obvious to combine Schantz et al. and Brennan, with Brown (disclosing multiple arrays on a substrate), the Examiner has not pointed to anything in the cited references which discloses or suggests the above feature. Further, the Examiner does not even allege that the cited references disclose or suggest that "the source of the error is corrected prior to dispensing of droplets for other of the arrays on the same substrate" or that "the deposition apparatus is operated so as to compensate for the error during dispensing of droplets for the same array or other of the arrays on the same substrate".

Accordingly, the rejection of claim 6 should be withdrawn for this additional reason.

Claim 16

This claim now recites:

> "wherein the sensing element is struck by droplets so as to generate electrical signals when the dispenser unit passes beyond the array being fabricated on each of multiple scans during fabrication of the array"

Thus, the sensing element is struck when the dispenser passes beyond the array on each of multiple passes during array fabrication. The Examiner does not point to anything in the relied upon references showing such a feature. Accordingly, for this additional reason the rejection of this claims should be withdrawn.

Claim 30

This claim has been amended to additionally require:

"when the error is detected the processor operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of the other droplets for other of the arrays on the same substrate"

Even assuming that the references can be combined in the manner suggested by the Examiner (which is disputed in Part II above), the Examiner has not pointed to any disclosure or suggestion where the apparatus will correct for the error before, or compensate for the error during, dispensing of the other droplets for other of the arrays on the same substrate. Accordingly, this rejection should be withdrawn for this additional reason.

IV. 35 U.S.C. 103(a) Rejections (Paragraph 9)

The Examiner rejected claims 26, 27 as being unpatentable over Schantz et al. (US 6,086,190) in view of Schantz et al (b) (US 5,442,385) and Brennan. This rejection is traversed first on the basis that there is no suggestion in the references to combineSchantz et al. with Brennan as discussed above in Part II ("All of the Rejected Claims"), and second on the basis that even if the references were combined as suggested by the Examiner, the claimed invention is still not obtained.

On the second point, claim 26 (and 27 which is dependent thereon) requires the presence of "at least six dispensers" and "at least six reservoirs communicating with respective dispensers". The Examiner contends that such a feature is disclosed in Schantz (b) and references column 7, lines 10-67 and Fig. 11. However, Fig. 11 and the accompanying description is merely a view of one embodiment of a Tape Automated Bonding ("TAB") assembly (see column 4, lines 18-21). Such an assembly is attached to the inkjet print cartridge of FIG. 1 (see column 3, lines 46-52). Fig. 5 shows a cross-section of a typical such assembly (column 3, lines 61-64). Note that in the assembled device of Figs. 1 and 5 there is only one reservoir 12 (column 4,

lines 30-31) which feeds the multiple "vaporization chambers 98" through a common single central slot 64 (column 6, lines 3-4) and then through two manifolds 100 and the ink channels 99 (column 7, lines61-63). Thus, Schantz (b) does not in fact disclose at least six dispensers with at least six reservoirs communicating with respective dispensers as required by this claim.

Accordingly, for this additional reason (the claimed invention is not obtained even assuming the correctness of the Examiner's proposed combination), the rejection of claim 26 (and claim 27 which is dependent thereon) should be withdrawn.

V. 35 U.S.C. 103(a) Rejections (Paragraph 10)

The Examiner rejected claims 21-25 as being unpatentable over Schantz et al. (a) (US 6,086,190) in view of Brennan as applied to claim 1 (see Part I above), and further in view of Fleischer et al. This rejection is traversed with regard to all of these claims first on the basis that there is no suggestion in the references to combineSchantz et al. with Brennan as discussed above in Part II ("All of the Rejected Claims"). The rejection is further traversed in relation to these claims for the additional reasons discussed below.

Claim 21

This claim further requires:

> "dispensing multiple droplets from the dispenser unit at each of at least two different distances from the sensor, and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance"

Even assuming the references provide a suggestion to combine them in the manner proposed by the Examiner (which is disputed in Part I), the invention of this claim is still not obtained. In particular, the Fleischer relates to detecting a drop position in an ink jet printing system (see, for example, column 2, lines 34-36). The Examiner makes the allegation that it would have been obvious because of this to dispense droplets at different distances from the sensor. However, even if this is true the the

Examiner does even attempt to point to any disclosure or suggestion in the references that "droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance" as required by claim 21. As the Examiner is aware, she has the burden of establishing a *prima facie* case of obviousness by pointing to a suggestion in the references to make the claimed invention. Since the Examiner has not pointed to any suggestion in the reerences for the foregoing feature she has not satisfied this burden, and the present rejection of claim 21 should therefore be withdrawn for this additional reason.

Claims 22-25

Claim 22 (from which 23-25 are dependent) further requires:

"wherein the performance characteristic evaluated comprises the placement of droplets by the dispenser unit"

The rejection of this claim is traversed for the additional reason that the Examiner has again not satisfied her burden to establish a *prima facie* case of obviousness. In particular, the Examiner states that Fleischer et al. teach the motivation for evaluating the relative positioning of droplet dispensing. However, Fleischer et al. only teach this in the context of conventional ink printing and not that this is needed in array fabrication. Furthermore, the Examiner states that "i.e. proper dispensing alignment is critical for quality substrate fabrication" but does not point to any suggestion in the references that dispensing alignment might be critical for biopolymer array fabrication (which are not images or text). Accordingly, the rejection of these claims should be withdrawn for this additional reason (failure to establish a *prima facie* case of obviousness).

VI. 35 U.S.C. 103(a) Rejections (Paragraph 11)

The Examiner rejected claims 38-42 as being unpatentable over Schantz et al. (a) (US 6,086,190) in view of Brennan as applied to claim 36 (see Part I above), and

further in view of Fleischer et al. This rejection is traversed with regard to all of these claims first on the basis that there is no suggestion in the references to combineSchantz et al. with Brennan as discussed above in Part II ("All of the Rejected Claims"). The rejection is further traversed in relation to these claims for the additional reasons discussed below.

Claim 38

This claim additionally requires that the processor:

> causes the dispenser unit to dispense multiple droplets at each of at least two different distances from the sensor, and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance"

The Examiner again relies upon Fleischer et al. for a suggestion for the foregoing element. However, as discussed above under "Claim 21" the Examiner has failed to satisfy her burden of establishing a *prima facie* case of obviousness by pointing to any disclosure or suggestion in the references that "droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance". For this additional reason the rejection of claim 38 should be withdrawn.

Claims 39 - 42

Claim 39 additionally includes the following element:

> "and evaluates the placement of droplets from the relative positions of the dispenser unit and the sensing element when the droplet series begins or ceases striking the sensing element"

Claim 40 (and 41-42 which are dependent thereon) contain a very similarly worded limitation. The Examiner again relies upon Fleischer et al. for a suggestion for this element. This is traversed for the same reasons discussed above under the sub-title "Claims 22-25" in Part V. Additionally, the Examiner does not even allege that the

references disclose using a droplet series in the recited manner. For this additional reason the rejection of these claims should be withdrawn.

Conclusion

In view of the above amendments and discussion, it is believed the present application should now be in condition for allowance. If the Examiner is of the view that there are any outstanding issues which might be resolved by means of a telephone conference, she is invited to call Gordon Stewart at (650)485-2386.

Respectfully submitted,

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APPENDIX

Showing All Amendments Presently Being Made

1. (AMENDED) A method of fabricating at least one addressable array of biopolymers with multiple features on a substrate using a drop deposition apparatus having a drop dispenser unit and a sensing element, comprising:

(a) for each of multiple addresses, dispensing droplets carrying the biopolymers or biopolymer precursors from a drop dispenser unit onto the sensing element, and onto the substrate so as to fabricate the array;

(b) detecting electrical signals resulting from dispensed droplets striking the sensing element;

(c) evaluating a performance characteristic of the deposition apparatus based on the detected signals

wherein the sensing element optionally comprises the substrate.

2. A method according to claim 1 wherein the electrical signals result from the droplets imparting an electrical stimulus to the sensing element.

3. A method according to claim 1 wherein a performance characteristic of the deposition unit is evaluated.

4. A method according to claim 1 additionally comprising:

when after the dispensing of some droplets onto the substrate an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, then the source of the error is corrected prior to dispensing of other of the droplets onto that same substrate or the deposition apparatus is operated so as to compensate for the error during dispensing of other of the droplets onto that same substrate.

5. A method according to claim 4 wherein the error is detected after the dispensing of some of the droplets for an array, and the source of the error is corrected

prior to dispensing of other of the droplets for the same array or the deposition apparatus is operated so as to compensate for the error during dispensing of other of the droplets for the same array.

6. A method according to claim 4 wherein:

multiple arrays are fabricated on the same substrate; and

wherein the error is detected after the dispensing of droplets for at least one of the arrays on the same substrate, and the source of the error is corrected prior to dispensing of droplets for other of the arrays on the same substrate or the deposition apparatus is operated so as to compensate for the error during dispensing of droplets for the same array or other of the arrays on the same substrate.

7. (AMENDED) A method according to claim 1 additionally comprising changing ~~a set of one or more reagents~~ biopolymers or biopolymer precursors in the dispenser unit to ~~a~~ different ~~set of reagents~~ biopolymers or biopolymer precursors, wherein the detection and evaluation are performed after the changing and before a dispensing of any droplets for an array.

8. A method according to claim 1 wherein an array is rejected based on the evaluated performance characteristic.

9. A method according to claim 4 wherein the dispenser unit comprises a pulse jet which ejects a droplet in response to a signal and which can de-prime, and the error is corrected by re-priming the pulse jet.

10. (AMENDED) A method according to claim 1, additionally comprising when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, ~~correlating the detected error with~~ identifying one or more features on the array which are defective as a result of the error.

11. (AMENDED) A method according to claim 10 additionally comprising communicating an identity ~~information relating to~~ of the identified defective features to a remote location or saving such information onto a storage medium.

12. A method according to claim 10 wherein the tolerance is 0.

13. A method according to claim 1 wherein:

the dispenser unit comprises one or more pulse jets which eject a droplet in response to a signal which require priming; and

the evaluated performance characteristic is whether one or more of the pulse jets are primed prior to dispensing any droplets for an array.

14. A method according to claim 13 additionally comprising, when an error is detected in which at least one of the pulse jets is not primed, then firing the pulse jet one or more times until the detected electrical signals indicate the pulse jet is primed.

15. (AMENDED) A method according to claim 1 wherein:

the dispenser unit is repeatedly scanned across the substrate while dispensing droplets so as to fabricate the array;

the sensing element is struck by droplets so as to generate electrical signals, when the dispenser unit passes beyond the array being fabricated on multiple scans during fabrication of the array.

16. (AMENDED) A method according to claim 15 wherein the sensing element is struck by droplets so as to generate electrical signals, when the dispenser unit passes beyond the array being fabricated on each of multiple scans during fabrication of the array.

17. A method according to claim 1 wherein the sensor comprises the substrate.

18. A method according to claim 1 wherein the evaluated performance characteristic is the size of droplets dispensed from the dispenser unit.

19. A method according to claim 1 wherein the evaluated performance characteristic is the velocity of droplets dispensed from the drop dispenser unit.

20. A method according to claim 19 wherein droplet velocity is evaluated based on the difference in time between when the dispenser unit was activated to dispense a droplet and the time when the resulting signal is detected.

21. A method according to claim 19 additionally comprising dispensing multiple droplets from the dispenser unit at each of at least two different distances from the sensor, and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance.

22. A method according to claim 1 wherein the performance characteristic evaluated comprises the placement of droplets by the dispenser unit.

23. A method according to claim 22 wherein the placement of droplets is evaluated from the relative positions of the dispenser unit and the sensing element when a series of droplets dispensed at different relative positions of the dispenser unit and sensing element begin or cease striking the sensing element.

24. A method according to claim 23 wherein:

the sensing element has an insensitive region intermediate sensitive regions such that a signal is not generated by the sensing element when a dispensed droplet becomes co-incident with the insensitive region; and

the placement of droplets is evaluated from the relative positions of the drop dispenser unit and the sensing element when a series of droplets dispensed at different relative positions of the drop dispenser unit and sensing element begin or cease striking the sensing element at a region about the insensitive region.

25. A method according to claim 24 wherein the insensitive region is an opening in the sensing element.

26. A drop deposition apparatus for fabricating at least one addressable array of biopolymers on a substrate, comprising:

(a) a drop dispensing unit having:

at least six dispensers each of which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the substrate so as to fabricate the array;

at least six reservoirs communicating with respective dispensers such that the dispensing unit can be simultaneously loaded with, and dispense between loadings, at least six different biopolymers or biopolymer precursors;

(b) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element.

27. An apparatus according to claim 26 wherein the sensing element and amplifier detect electrical signals resulting from the droplets imparting an electrical stimulus to the sensing element.

28. An apparatus for fabricating at least one addressable array of biopolymers on a substrate, comprising:

(a) a drop dispensing unit which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the substrate so as to fabricate the array;

(b) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element;

(c) a processor which:

causes the drop dispensing unit to dispense droplets toward the sensing element after the dispensing of some droplets onto the substrate and evaluates a performance characteristic of the dispensing unit based on the resulting detected signals; and

when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance then the processor, prior to causing the drop dispenser to dispense droplets onto that same substrate, activates an operator alert or

operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of other of the droplets onto that same substrate.

29. An apparatus according to claim 28 wherein:

the processor causes the drop dispensing unit to dispense droplets toward the sensing element after dispensing of some droplets for an array; and

when the error is detected the processor activates the operator alert or operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of the other droplets for that same array.

30. (AMENDED) An apparatus according to claim 4 wherein:

the processor causes the drop dispensing unit to dispense droplets so as to form multiple arrays on the same substrate, and to dispense droplets toward the sensing element after dispensing some of the droplets for the arrays on the same substrate;

when the error is detected the processor ~~activates the operator alert or~~ operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of the other droplets for other of the arrays on the same substrate.

31. (AMENDED) An apparatus for fabricating at least one addressable array of biopolymers with multiple features on a substrate, comprising:

(a) a drop dispensing unit which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the substrate so as to fabricate the array;

(b) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element;

(c) a processor which:

causes the drop dispensing unit to dispense droplets toward the sensing element after the dispensing of some droplets onto the substrate and evaluates a performance characteristic of the apparatus based on the resulting detected signals; and

when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, ~~correlates the detected error with~~ identifies one or more features on the array which are defective as a result of the error.

32. (AMENDED) An apparatus according to claim 31 wherein the processor additionally communicates ~~information relating to the~~ an identity of the identified defective features to a remote location or saves such information onto a storage medium.

33. (AMENDED) A method according to claim 31~~10~~ wherein the tolerance is 0.

34. An apparatus for fabricating at least one addressable array of biopolymers on a substrate, comprising:

(a) a substrate holder onto which the substrate may be mounted;

(b) a drop dispensing unit which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the mounted substrate so as to fabricate the array;

(c) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element, wherein the sensing element comprises the substrate holder such that dispensed droplets striking a mounted substrate generated the electrical signals which are conveyed through at least part of the substrate holder;

(d) a processor which causes the drop dispensing unit to dispense droplets toward the sensing element and evaluates a performance characteristic of the apparatus based on the resulting detected signals.

~~35. An apparatus for fabricating at least one addressable array of biopolymers on a substrate, comprising:~~

~~(a) a drop dispensing unit which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the mounted substrate so as to fabricate the array;~~

~~(b) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element, wherein the sensing element comprises the substrate holder such that dispensed droplets striking a mounted substrate generate the electrical signals which are conveyed through at least part of the substrate holder;~~

~~(c) a processor which causes the drop dispensing unit to dispense droplets toward the sensing element and evaluates a performance characteristic of the apparatus based on the resulting detected signals.~~

36. An apparatus for fabricating at least one addressable array of biopolymers on a substrate, comprising:

(a) a drop dispensing unit which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses on the mounted substrate so as to fabricate the array;

(b) a sensing element and amplifier to detect electrical signals resulting from dispensed droplets striking the sensing element;

(c) a processor which causes the drop dispensing unit to dispense droplets toward the sensing element and which evaluates a performance characteristic of the apparatus based on the resulting detected signals, wherein the evaluated performance characteristic is the velocity or placement of droplets.

37. An apparatus according to claim 36 wherein the processor evaluates droplet velocity based on the difference in time between when the dispenser unit was activated to dispense a droplet and the time when the resulting signal is detected.

38. An apparatus according to claim 36 wherein the processor causes the dispenser unit to dispense multiple droplets at each of at least two different distances from the sensor, and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance.

39. An apparatus according to claim 36 wherein the processor causes the dispenser unit to dispense a series of droplets at different relative positions of the

dispenser unit and the sensing element, and evaluates the placement of droplets from the relative positions of the dispenser unit and the sensing element when the droplet series begins or ceases striking the sensing element.

40. An apparatus according to claim 36 wherein:

the sensing element has an insensitive region intermediate sensitive regions such that a signal is not generated by the sensing element when a dispensed droplet becomes co-incident with the insensitive region but is generated when a dispensed droplet strikes any of the sensitive regions; and

the processor causes the dispenser unit to dispense s series of droplets at different relative positions of the dispenser unit and the sensing element, and evaluates the placement of droplets from the relative positions of the drop dispenser unit and the sensing element when the droplet series begins or ceases striking the sensing element at a region about the insensitive region.

41. An apparatus according to claim 40 wherein the insensitive region is an opening in the sensing element.

42. An apparatus according to claim 40 wherein the insensitive region is a gap between sensitive regions in the form of linear conductors.

43. A computer program product comprising a computer readable storage medium carrying computer readable program code, for use with an apparatus for fabricating an array of features which apparatus includes a drop deposition unit and a sensing element, the program code when loaded into the computer performing the steps of:

(a) for each of multiple addresses, dispensing droplets carrying the biopolymers or biopolymer precursors from a drop dispensing unit onto the substrate, so as to fabricate the array;

(b) detecting electrical signals resulting from dispensed droplets striking a sensing element during step (a);

(c) evaluating a performance characteristic of the apparatus based on the detected signals; and

(d) when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance then, prior to causing the drop dispenser to dispense droplets onto that same substrate, activating an operator alert or operating the apparatus so as to correct for the error before, or compensate for the error during, dispensing of other of the droplets onto that same substrate.

44. (AMENDED) A computer program product comprising a computer readable storage medium carrying computer readable program code, for use with an apparatus for fabricating an array of features which apparatus includes a drop deposition unit and a sensing element, the program code when loaded into the computer performing the steps of:

(a) for each of multiple addresses, dispensing droplets carrying the biopolymers or biopolymer precursors from a drop dispensing unit onto the substrate, so as to fabricate the array;

(b) dispensing droplets toward the sensing element after the dispensing of some droplets onto the substrate;

(b) detecting electrical signals resulting from dispensed droplets striking a sensing element during step (b);

(c) evaluating a performance characteristic of the apparatus based on the detected signals; and

(d) when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, identifying ~~correlating the detected error with~~ one or more features on the array which are defective as a result of the error.